Pedagogical advantages of 3D virtual field trips and the challenges for their adoption

Conference or Workshop Item

Pedagogical advantages of 3D virtual field trips and the challenges for their adoption

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OU, Field Studies Council, Daden UK, Design Thinkers UK

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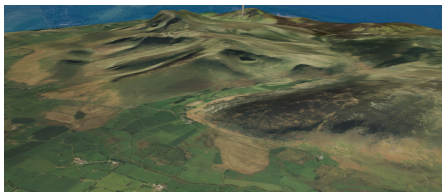
Innovate UK
Technology Strategy Board

Virtual Skiddaw: Virtual Geology Field trip

- Unity application developed in 2013 - 2014
- Support physical field trips: planning, on-site, revision, unable to attend
- 10km x 10km area of the Lake District within this virtual environment
- Walk, fly or teleport navigation (with compass & minimap); multi-user
- Terrain, Map and Geology overlays

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An initiative of The Open University and The Wolfson Foundation
This online laboratory brings interactive practical science to students anywhere and anytime the internet is available. The laboratory features investigations based on on-screen instruments, remote access experiments and virtual scenarios using real data. Several activities are available to all, while others are available only to registered users.
Come in and look around.
Lab tour
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Showing 73 of 85 experiments.
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AWARD WINNER
OUTSTANDING ICT INITIATIVE OF THE YEAR
OpenScience Lab News
OSL hosts workshop on Remote Experiments in HE - 13 May 2015
We were joined by a number of colleagues from around the world with expertise in designing and ...
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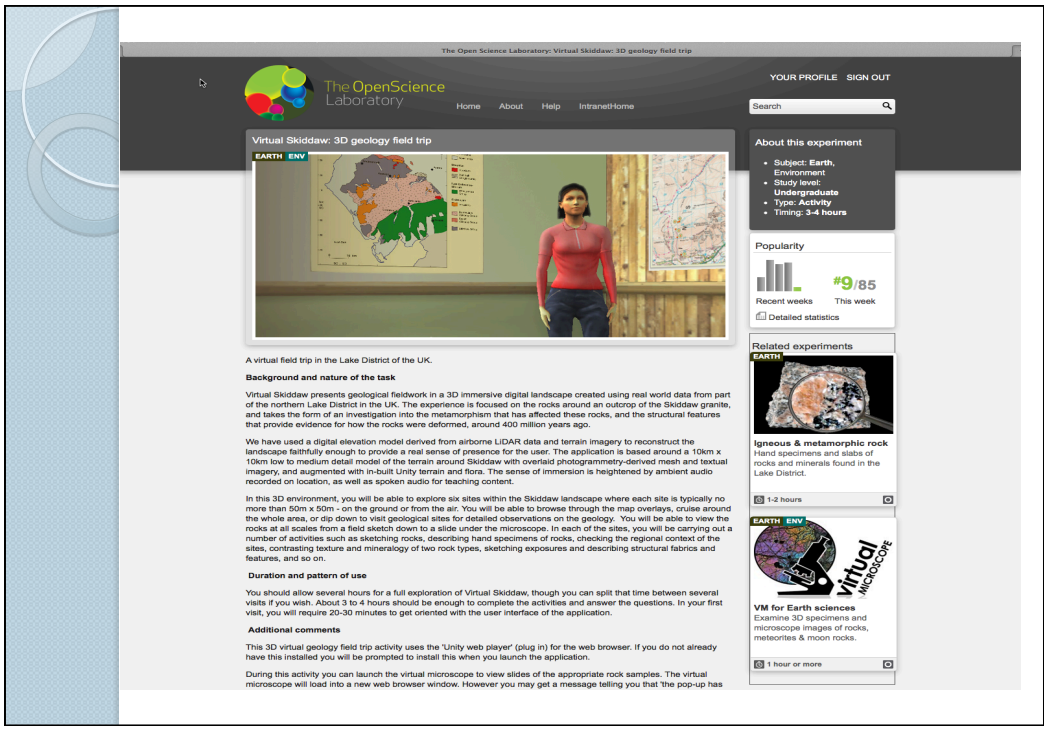
Virtual Skiddaw: 3D geology field trip
A virtual field trip in the Lake District of the UK.
3-4 hours
Popular experiments
Histology & histopathology
A collection of 320 annotated slides covering basic histology and histopathology.
1-15 hours
Variation in vegetation: the heather hypothesis
Sample virtual transects to gather data on species of heather.
2.5 hours
All experiments (filtered; page 1 of 7)
Sorting out soils
Examine the physical and chemical characteristics of soil.
2.5 hours
Adipose tissue: virtual microscope
A collection of annotated slides covering adipose tissue.
1-2 hours or more
Explore the Moon with nQuire
Investigate samples of Moon rock with our Virtual Microscope.
2 hours


The Open Science Laboratory: Virtual Skiddaw: 3D geology field trip
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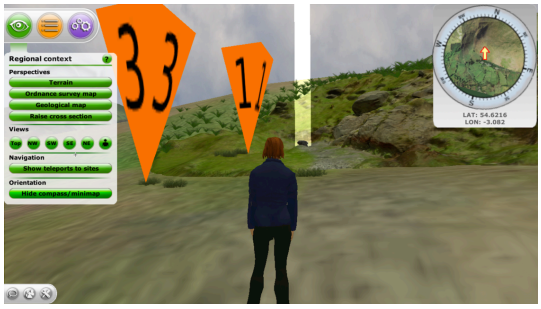
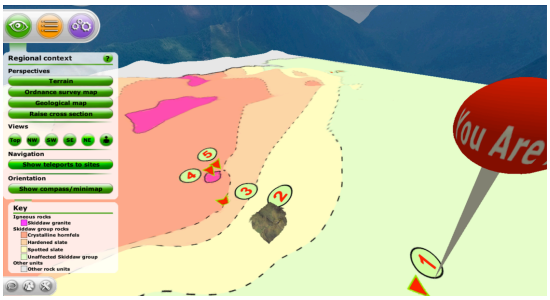
Virtual Skiddaw: 3D geology field trip
About this experiment
Subject: Earth, Environment
Study level: Undergraduate
Type: Activity
Timing: 3-4 hours
Popularity
#9/85
Recent weeks
This week
Detailed statistics
Related experiments
Igneous & metamorphic rock
Hand specimens and slabs of rocks and minerals found in the Lake District.
1-2 hours
VM for Earth sciences
Examine 3D specimens and microscope images of rocks, meteorites & moon rocks.
1 hour or more
A virtual field trip in the Lake District of the UK.
Background and nature of the task
Virtual Skiddaw presents geological fieldwork in a 3D immersive digital landscape created using real world data from part of the northern Lake District in the UK. The experience is focused on the rocks around an outcrop of the Skiddaw granite, and takes the form of an investigation into the metamorphism that has affected these rocks, and the structural features that provide evidence for how the rocks were deformed, around 400 million years ago.
We have used a digital elevation model derived from airborne LiDAR data and terrain imagery to reconstruct the landscape faithfully enough to provide a real sense of presence for the user. The application is based around a 10km x 10km low to medium detail model of the terrain around Skiddaw with overlaid photogrammetry-derived mesh and textual imagery, and augmented with in-built Unity terrain and flora. The sense of immersion is heightened by ambient audio recorded on location, as well as spoken audio for teaching content.
In this 3D environment, you will be able to explore six sites within the Skiddaw landscape where each site is typically no more than 50m x 50m - on the ground or from the air. You will be able to browse through the map overlays, cruise around the whole area, or dip down to visit geological sites for detailed observations on the geology. You will be able to view the rocks at all scales from a field sketch down to a slide under the microscope. In each of the sites, you will be carrying out a number of activities such as sketching rocks, describing hand specimens of rocks, checking the regional context of the sites, contrasting texture and mineralogy of two rock types, sketching exposures and describing structural fabrics and features, and so on.
Duration and pattern of use
You should allow several hours for a full exploration of Virtual Skiddaw, though you can split that time between several visits if you wish. About 3 to 4 hours should be enough to complete the activities and answer the questions. In your first visit, you will require 20-30 minutes to get oriented with the user interface of the application.
Additional comments
This 3D virtual geology field trip activity uses the 'Unity web player' (plug in) for the web browser. If you do not already have this installed you will be prompted to install this when you launch the application.
During this activity you can launch the virtual microscope to view slides of the appropriate rock samples. The virtual microscope will load into a new web browser window. However you may get a message telling you that 'the pop-up has


Choose an avatar below:
Enter Skiddaw


Mandatory items
Optional items
22°C
Rucksack
Wellington boots
Hiking boots
Waterproofs
Sunscreen
Binoculars
Sun hat
Water
Gloves
Camera
Grain size chart
Hand lens
Food
Sunglasses


Regional context
Perspectives
Terrain
Ordnance survey map
Geological map
Raise cross section
Views
Navigation
Show teleports to sites
Orientation
Hide compass/minimap
33
1/
LAT: 54.6216
LON: -3.082


Grain Size
VC
C
M
F
VF
Click chart to get micron scale
Instructions
Grain chart
Reset zoom
Full zoom
Finish


Regional context
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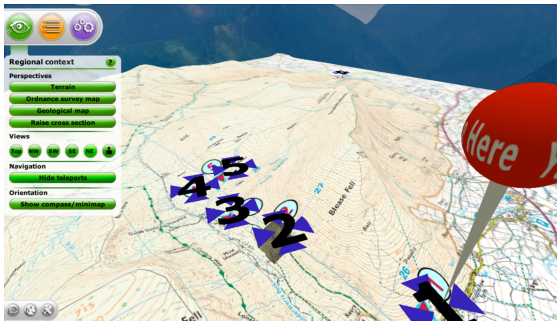
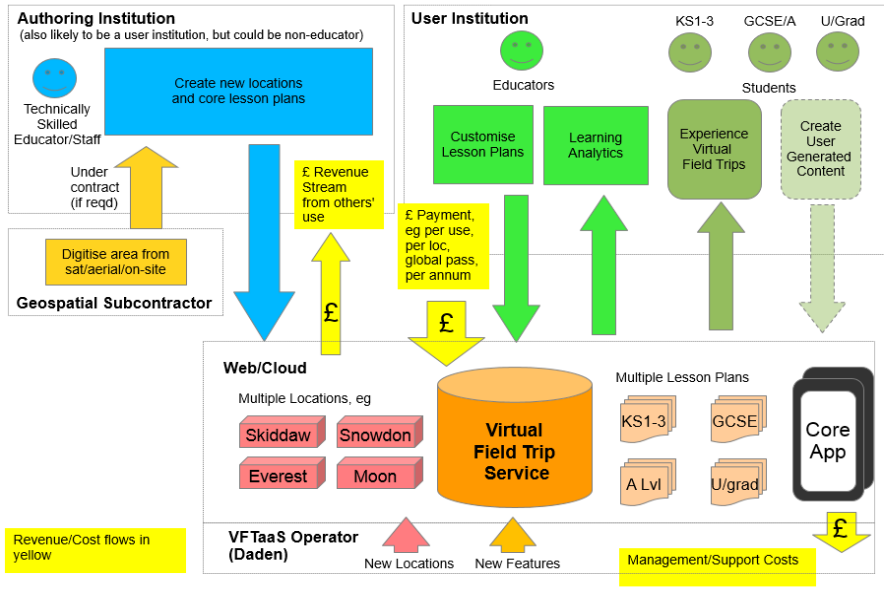

Regional context
Perspectives
Terrain
Ordnance survey map
Geological map
Raise cross section
Views
Navigation
Hide teleports
Orientation
Show compass/minimap
Here
1
2
3
4
5


Skiddaw Granite
Fault
Fault
Mean sea level
Skiddaw Granite
Fault
Skiddaw Granite


Site 2
Blease Beck
Task list
Show sketch point
Highlight rock
Open phase diagram

Virtual Field Trip Service Ecosystem



Commercial

- IP
- licensing aspects
- relationship between schools, FE and HE
- cost to schools; cost to HE

Pedagogical

- effectiveness of physical field trips
- CPD for educators
- lesson-planning
- inter-disciplinarity

Constraints

- resources (budgets, time, technology)
- digital literacy skills
- assessment criteria are for physical field trips

Technological

- relationship between schools, FE and HE
- design and development
- support and maintenance

pedagogy?
value for students and educators

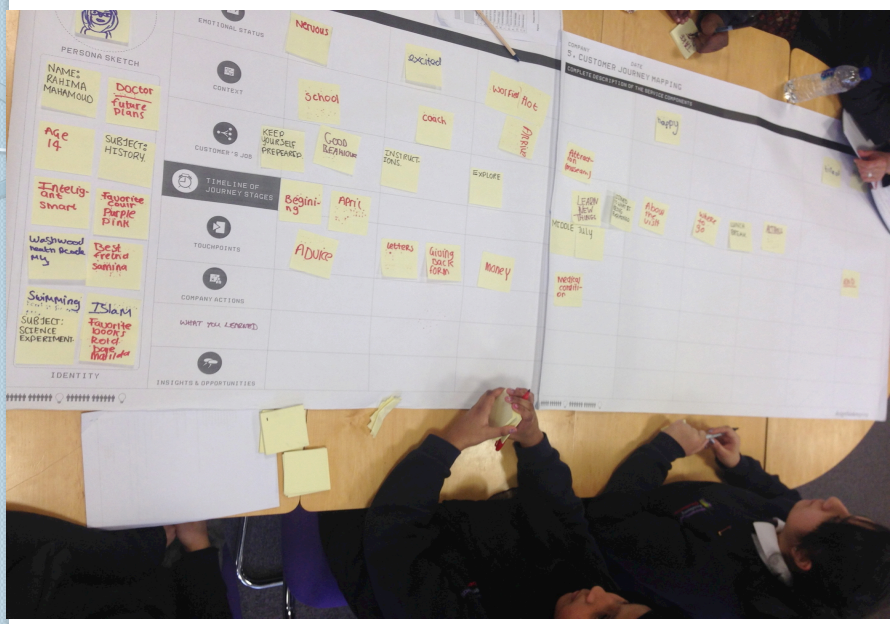
challenges of deployment
schools
higher education

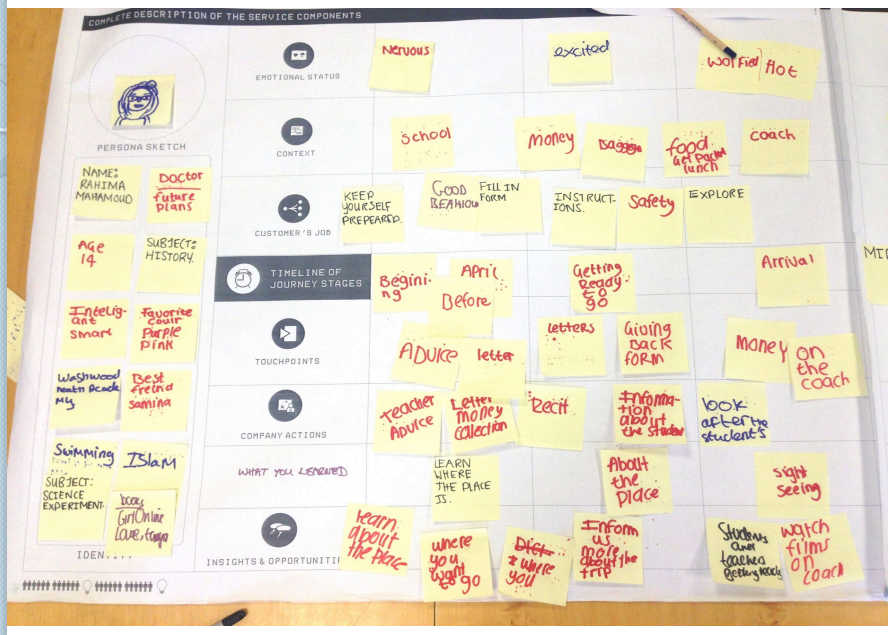
physical field trip
how does a virtual field trip help?

Methodology

- Online survey: students, educators and fieldtrip professionals
- Workshops including two in Second Life (a 3D virtual world): school students and teachers, HE educators
- Interviews: school teachers, IT support/leads in schools, assessment bodies, Ordnance Survey
- Demos of Virtual Skiddaw

Over 120 participants from different stakeholder groups including international STEM colleagues in virtual world workshops


PERSONA SKETCH
NAME: RAHIMA MAHAMOUD
Doctor
Future plans
Age 14
SUBJECTS: HISTORY
Intelligent
Smart
Favorite colour Purple Pink
Washington Redskins
Best friend Samina
Swimming
SUBJECT: SCIENCE EXPERIMENT
Islam
Favorite book? Read books in Arabic
IDENTITY
EMOTIONAL STATUS
Nervous
CONTEXT
School
excited
coach
World Riot
CUSTOMER'S JOB
KEEP YOURSELF PREPARED
Good Relations
TIMELINE OF JOURNEY STAGES
Beginning
TOUCHPOINTS
ADUKE
letters
Giving back form
Money
COMPANY ACTIONS
INSIGHTS & OPPORTUNITIES
CUSTOMER JOURNEY MAPPING
EXPLORE



Findings: advantages of 3VFTs for students

- Development of fieldwork skills

…we feel that this could be a useful tool for rehearsing geographical skills - very important revision tool; it gives life to the curriculum" (meeting with an assessment body)

- Pre-fieldtrip orientation and preparation

…if they [3D VFTs] are able to make them prepared for a physical field trip - it is a really good idea - students like to get into rivers and on the beaches - river studies - flow meters - students collect the data - so, how they could be prepared for real-life work by having access to the kinds of data that they will be collecting (meeting with an assessment body)

Findings: advantages of 3VFTs for students

- Post-field trip de-briefing, reflection and revision

After the real world field trip, a virtual world may be used to aid students' reflection on the experience, perhaps by revisiting features of particular interest to find out more or revising concepts that they didn't grasp the first time round. (an HE educator)

- Greater efficiency of physical field trips (in terms of time and number of physical field trips)

Much of the time in the field is wasted because students aren't adequately prepared and able to start work immediately. In biology (my field) species recognition is a particular problem and it takes a lot of time getting students to recognise and name species in order to carry out quantitative fieldwork. (an HE educator)

Findings: advantages of 3VFTs for students

- Replacement or near-equivalent experience for students with mobility and other constraints

…my school is very rural... Field trips simply can't happen. This gives us an avenue and they enjoy it. Adds incredibly to the curriculum. (Biology teacher, Science Circle workshop)

Have you heard of the pupil referral unit where students are taken out of mainstream education due to mental problems or behavioural problems or any other problems with the family - but they have 'right to access' …- so, I do think that VFTs will be helpful for accessibility. It will open the doors for them particular when you saying that VFTs can be used for different subjects like Geography, Geology and will bring the curriculum "alive". (meeting with an assessment body)

- Being able to complete physical field trips that may have got disrupted by weather or other interruptions

If the VFT has the same location as the physical field trip, activities that would otherwise be 'lost' can be conducted in a VFT. (meeting with an assessment body)

Findings: advantages of 3VFTs for educators

- Enable educators to rehearse and plan before a physical field trip

yes, absolutely VFT will be perceived as a useful tool for educators to prepare their lesson plans for physical field trips; but the skills are varied. (meeting with an assessment body)

- Continuing Professional Development (CPD) for educators

CPD for science teachers in the UK is poorly supported and undervalued in schools. Also scientists don't talk to geographers etc. There is an opportunity here [with the VFT and VFTaaS]. (email correspondence with a field studies expert)

Findings: challenges

- Being convinced about the role of VFTs

I am gravely concerned about how virtual scenarios are looked increasingly upon by university management as viable alternatives to genuine fieldwork, idealised learning scenarios do not offer any alternative to the development of real field observational skills, and they offer the students an unrealistic alternative to real geology, which is never available for genuine geological work." (survey; educator)

- Digital literacy skills of educators

With GIS also, we have found that educators have different level of expertise; not all teachers are IT literate. (meeting with an assessment body)

Findings: challenges

- IT infrastructure and support in institutions

Some schools have just one PC for the entire classroom while other schools are buying iPads for each student. (meeting with an assessment body)

faculty can use whatever they choose, but IT will only support what they deploy. Cost and possible extent of use across the university would be considered by IT before a new deployment. (survey; educator)

Our external access is controlled by the Local Authority – so you need to get them on side (ICT manager at an Academy schools)

VFTaaS Key Questions

- Does the Virtual Field Trip as a Service concept sounds like something that would be useful to you and your school/college/university/students? What needs would it address?
- What do you see as its biggest attractions/benefits?
- What do you see as the biggest challenges to getting this into teachers hands (i.e. getting it into the school)?
- What do you see as the biggest challenges to getting student and teacher value from it?
- What payment models would be acceptable to institutions?
- In comparison to Second Life/OpenSim what would you like to bring/leave/add to VFTaaS?